REMARKS

The application has been amended and is believed to be in condition for allowance.

Claims 15-20 have been added.

Claims 1-3, 5-10, and 12-14 stand rejected as obvious over NITTA et al. 6,661,402 in view of USUI et al. 5,844,533.

Claims 4 and 11 stand rejected as obvious over NITTA et al. and USUI et al. in further view of LIAW et al. 6,483,494.

As a starting point, one should be mindful of what the invention is and what the claims recite.

The present invention concerns data being currently output, one horizontal scan line at a time, on scan lines G1, G2, through Gn of Figure 9 (that is, data of a single frame image). This data is being output through the plural signal lines S1, S2 through Sn, where, for any one signal line Si, the data is output one scan line at a time. That is, for signal line Si, data is output to G1, then data is output to G2, then data is output to G3 during consecutive horizontal time periods.

In Figure 9, there is shown pre-charging circuit 25 switched, in sequential turn, to scan lines G1, G2, …, through Gn. Figure 10 details the signal line driving circuit 22 Figure 9.

The switches SWn1, SWn2 are respectively turned on and off in accordance with pulse signals SP1, SP2 sent from the

external timing generator 21 as per Figure 11. As can be understood from periods T1, T2 of Figure 11, this conventional signal line driving circuit always carries out the pre-charging operation irrespectively of the gradation voltage sent before and after any given horizontal period. This approach results in excessive power consumption for, e.g., portable apparatuses.

The circuit of the present invention provides a signal line driving circuit in which a consumptive electric power is reduced. The inventive signal line driving circuit applies a pre-charging voltage and a gradation voltage using a picture data comparator for comparing a picture data before one horizontal period with a picture data to be next displayed for each signal line. That is, for signal line Si, the picture data comparator compares a picture data already output for G1 with a picture data to be output for G2; and, in the next horizontal time period, a picture data output for G2 with a picture data to be next output for G3, … . In accordance with each comparison result, a switch controller controls a supply of the pre-charging voltage. That is, the comparison between the picture data of G1 and G2 controls the pre-charging voltage of each Si signal line.

A signal line driving method according to the present invention compares, for each signal line, a picture data of the last horizontal period with a picture data to be next displayed, in the current horizontal period, and controls a supply of the

pre-charging voltage in accordance with the compared result. In this way, the pre-charging voltage of each signal line Si, at each new horizontal scan line, is determined by a comparison with between the next to be displayed picture data for that scan line Gi with the just displayed picture data on the previous scan line G(i-1). If a difference between the gradation voltage applied in the previous horizontal time period, at G(i-1), and the gradation voltage of the picture data to be next displayed, at Gi, is small, the pre-charging operation is not always necessary and is omitted for power savings.

This approach is conceptually and structurally different from the applied art.

As acknowledged, by the Official Action, NITTA et al. do not include the recited comparator which compares data to be next displayed with data displayed one scan line period before, i.e., data displayed on the last scan line associated with the particular display line Si. Note, both the "data to be next displayed" and the "data before one horizontal period" are of the same frame image.

USUI et al. is offered as disclosing "display data for the current screen with that for the immediately previous screen." That is, USUI et al. compare data for the next to be displayed frame with data of the last frame.

This is not the method or structure of the present invention. Thus, even if the references are combined, they do not result in the present invention.

The independent claims have been amended to clarify the claimed invention. See, e.g., claim 1 reciting a picture data comparator for comparing, for each signal line, picture data between two consecutive horizontal periods by comparing the picture data before one horizontal period with the picture data to be next displayed in the one horizontal period.

The applied references, either individually or in any reasonable combination, fail to teach or suggest the presently recited invention. Neither NITTA et al. nor USUI et al. teach the recited comparison of different scan lines on a signal line (picture data of a next to be displayed line with picture data of the last displayed line), and using that comparison as a basis for supplying pre-charging voltage on the signal line.

NITTA et al. is acknowledged by the Official Action as not teaching the recited feature. Indeed, NITTA et al., in the offered embodiment, determine whether or not pre-charge control is performed based on the signal strength of the current gray display data. NITTA et al. teach a ***pre-charge control circuit 735*** checking the display data 723 of each output to decide whether to perform "pre-charging" corresponding to the gray-scale voltage as per Figure 11. More specifically, a pre-charge

validity signal is generated by decoding the high-order two bits of an 8-bit gray display data, where, out of 256 gradations from gradations 1-256, pre-charging is not performed for gradations 1-64 but is performed for gradations 65-256.

That "pre-charging" AMP1 is a pre-charge voltage generated by **amplifying the current gray-scale voltage 730 by a factor of (1+RL1/RG1)**. Thus, the fundamental teaching is to pass a data signal without amplification if the signal is small, and to pass the signal with amplification if the signal is large. See Figures 9-10.

Thus, as acknowledged by the Official Action, NITTA et al. fail to disclose the recited picture data comparator.

For this feature, USUI et al., column 1, lines 64-66, and column 2, lines 4-15, have been offered. As stated by the Official Action, USUI et al. disclose "display data for the current screen with that for the immediately previous screen." That is, USUI et al. compare data for the next to be displayed frame with data of the last frame, and do not disclose that recited.

On page 4 of the Official Action, it is said that it would have been obvious to "combine the invention of NITTA et al. with the invention of USUI et al. by comparing picture data of the current display with that for the immediately previous

display in order to control a pre-charge voltage" in order to accomplish quick response and high image quality.

Applicant need not respond to whether the combination is fairly motivated to one of skill as, even if the two references are combined, they would not teach the features of the independent claims.

Additionally, the features of the dependent claims are believed both novel and non-obvious. However, these differences need not be discussed as the claims are believed allowable at least for depending from an allowable independent claim.

Further, the features of the new claims are believed patentable. Neither NITTA et al. nor USUI et al. are seen as anticipating or rendering obvious a signal line driving circuit as recited by claims 15-20.

These references do not teach a signal line connection for supplying signal line potential during consecutive horizontal time periods, a first portion of each time period being reserved for supplying *a fixed value pre-charging voltage* and a second portion of each time period being reserved for supplying a picture data gradation voltage.

These references are not seen as teaching the recited structure of a last data latch (11) for holding picture data from a last picture data before a current horizontal period, a comparator (12), connected to an output of the last data latch,

for comparing the picture data from the last data latch with a picture data to be next displayed for each signal line, and a switch controller (13) for supplying the middle potential (Vp) to the signal line connection, as the pre-charging voltage, in accordance with a compared result by the comparator.

See also the recitation of "the gradation voltage and the pre-charging voltage being applied to the signal lines at mutually exclusive times."

Accordingly, allowance of claim 15 and dependent claims 16-20 is solicited.

The recitations of claim 16 include:

current data latch (33) for receiving the picture data to be next displayed for each signal line, the current data latch providing picture data to the last data latch;

a decoder (34) connected to an output of the current data latch;

an analog switch (35) connected to an output of the decoder and supplying graduation voltages corresponding to the picture data to be next displayed;

an output circuit (36) connected to an output of the analog switch;

a first switch (SW1) connected on an input side to an output of the output circuit, and connected on an output side to the signal line connection; and

a second switch (SW2) connected on an input side to the middle voltage terminal, and connected on an output side to the signal line connection,

the first switch and the second switch operating under control of the switch controller so that when the first switch is turned on, the gradation voltage is applied from the output circuit to the signal line connection, and when the second switch is turned on, the middle potential is supplied to the signal line connection as the pre-charging voltage.

These features are not seen in the two applied references.

Claim 17 recites a third switch under control of the switch controller; and another middle potential connection (Vq) connected via the third switch to the signal line connection to pre-charge the signal line connection ***in alternating current inversion driving***. This is not found in these two references.

Nor do the references teach the that switch controller has a polarity inversion signal input, and the comparator compares n-bits of the picture data from the last data latch with n-bits of the picture data to be next displayed for each signal line, and then outputs the comparison result to the switch controller, the switch controller controls so as to turn on and off the first, second and third switches, on the basis of the

comparison result signal CMP and the inputted polarity inversion signal.

Applicant has also not found, in these two applied references, the recitation of claims 18-20, e.g., that the switch controller applies the pre-charging voltage ***only if*** a polarity of said gradation voltage of said picture data to be next displayed ***is different*** from a polarity of said gradation voltage of said picture data before one horizontal period. Also, the amplifiers of NITTA et al. are not seen to teach the claim 20 recitations of a switch controller that

"applies said gradation voltage by using a first operational amplifier suitable for a boosting operation if said gradation voltage of said picture data to be next displayed is higher than said gradation voltage of said picture data before one horizontal period,

"applies said gradation voltage by using a second operational amplifier suitable for a voltage drop operation if said gradation voltage of said picture data to be next displayed is lower than said gradation voltage of said picture data before one horizontal period, and

"applies said gradation voltage by using any one of said first and second operational amplifiers if said gradation voltage of said picture data to be next displayed is equal to

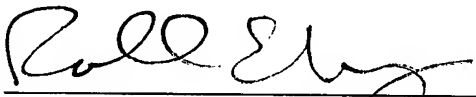
said gradation voltage of said picture data before one horizontal period."

In view of the above, applicant believes that the present application is in condition for allowance and an early indication of the same is respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. §1.16 or under 37 C.F.R. §1.17.

Respectfully submitted,

YOUNG & THOMPSON



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